Lista Práctica de Ejercicios: Ecuaciones de Bernoulli

Nivel I (Básico)

1. $y' + \dfrac{1}{x}\, y = \dfrac{y^3}{x}$.
2. $y' - \dfrac{1}{x}\, y = -\dfrac{1}{x}\, y^2$.
3. $y' + \dfrac{2}{x}\, y = -\dfrac{x\, y^2}{2}$.
4. $y' + \dfrac{1}{x}\, y = x\, y^2$.
5. $y' + \dfrac{1}{x}\, y = \dfrac{\ln x}{x}\, y^{-2}$.
6. $y' + \dfrac{y}{x} = x^3\, y^4$.
7. $y' - \dfrac{2}{x}\, y = \dfrac{1}{x^2}\, y^3$.
8. $y' + \dfrac{2}{x}\, y = \dfrac{1}{x^2}\, y^3$. (derivada de $x^2y' + 2xy = y^3$)
9. $y' - \dfrac{1}{x}\, y = \dfrac{1}{x}\, y^4\, \ln x$.
10. $y' + \dfrac{y}{x} = x\, y^2$. (derivada de $x\, y' + y = x^2y^2$)

Nivel II (Intermedio)

11. $y' + 3\, y = x^2\, y^{\frac{1}{2}}$.
12. $y' - 4\, y = 2\, e^x\, y^{\frac{1}{2}}$.
13. $y' + \tan x\, y = \cos(2x)\, y^{-2}$.
14. $y' - \sin x\, y = \cos x\, y^2$.
15. $y' + e^x\, y = x\, y^3$.
16. $y' + (2x+1)\, y = e^{-x}\, y^4$.
17. $y' + \cos t\, y = \sin t\, y^3$.
18. $y' - \ln x\, y = x^2\, y^3$.

19. $y' + (x^2+1)\,y = x\,y^2$.

20. $y' + \sqrt{x}\,y = x\,y^{0.8}$.

21. $y' + \dfrac{2}{1+x^2}\,y = \tan x\,y^{0.5}$.

22. $\dfrac{dy}{dx} - \dfrac{3}{t}\,y = t^2\,y^{-1}$.

23. $\dfrac{dy}{dx} + \dfrac{y}{1-t} = e^t\,y^5$.

Nivel III (Avanzado)

23. $\dfrac{dy}{dx} = y + x\,y^5$.

24. $y' + 2x\,y = -\,x\,y^4, \quad y(0) = 1$.

25. $\dfrac{dy}{dx} = y^2\,\ln x - \dfrac{y}{x}$.

26. $x\,y' - 2\,y = 4\,x^3\,\sqrt{y} \quad \Longrightarrow \quad y' - \dfrac{2}{x}\,y = 4\,x^2\,y^{\frac{1}{2}}$.

27. $3t\,x' - 2x = \dfrac{t^3}{x^2} \quad \Longrightarrow \quad x' - \dfrac{2}{3t}\,x = \frac{1}{3}\,t^2\,x^{-2}$.

28. $x' = e^t\,x^7 + 2x \quad \Longrightarrow \quad x' - 2x = e^t\,x^7$.

29. $y' + \sin x\,y = x^3\,y^2$.

30. $y' + \ln x\,y = x^2\,y^3$.

31. $\dfrac{dy}{dx} + \dfrac{3}{x+2}\,y = (x+2)\,y^4$.

32. $y' + \dfrac{x}{1+x^2}\,y = \dfrac{1}{1+x^2}\,y^3$.

Ejercicios de Problema 3 (Bernoulli)

a) $\dfrac{dy}{dx} = \dfrac{y^2+2xy}{x^2} \implies y' - \dfrac{2}{x}\,y = \dfrac{1}{x^2}\,y^2$.

b) $y' = x\,y^{\frac{1}{2}} - y \implies y' + y = x\,y^{\frac{1}{2}}$.

c) $\dfrac{dy}{dx} = \dfrac{y^3}{x^3} - \dfrac{2y}{x} \implies y' + \dfrac{2}{x}\,y = \dfrac{1}{x^3}\,y^3$.